power receiver **11**, examples of ways in which the method of FIG. **2** may be applied thereto will be described.

[0044] Referring again to FIG. **2**, and as discussed above, step S**1** involves increasing the energy stored in matching network **6** and/or transmit coil **10** and exciting their resonance. In the context of the drive circuits of FIGS. **3** and **4**, step S**1** may include increasing the energy stored in any one or more of the capacitive or inductive elements of the drive circuit **7**. Initially, the energy stored in drive circuit **7** may be zero. However, the techniques described herein are not limited to starting with zero energy stored in the drive circuit **7**. In some embodiments, energy may be transferred to the drive circuit **7** by switching one or more transistors of the inverter **3** to provide energy to the capacitor(s) and/or inductor(s) of the drive circuit **7** from the supply voltage VDC.

[0045] As an example, the switches of the inverter **3** may be switched at a selected switching frequency to transfer energy into the drive circuit **7**. The amount of energy transferred to the drive circuit **7** by switching the inverter **3** depends upon the magnitude of the supply voltage VDC, the switching frequency, and the amount of time for which the switching occurs. In some embodiments, it is desirable to limit the amount of energy transferred to the drive circuit to limit power dissipation when performing foreign object detection. The amount of energy transferred may be limited by setting VDC at a lower voltage during foreign object detection as compared to its value during power transmission. Alternatively or additionally, the switching frequency may be selected to control the amount of energy transferred. The farther away the switching frequency of the inverter **3** is from the resonant frequency of the drive circuit **7**, the less energy will be transferred into the drive circuit **7** per unit time. The amount of time for which inverter **3** is switched also affects the amount of energy transferred. Reducing the amount of time for which inverter **3** is switched can reduce the amount of energy transferred to drive circuit **7**. However, the techniques described herein are not limited to transferring energy into the drive circuit **7** by switching the inverter **3**, as in some embodiments energy transfer to the drive circuit **7** may be performed by connecting the passive component(s) of drive circuit **7** to VDC (e.g., through inverter **3**), or a separate circuit may be used to provide energy to the passive component(s).

[0046] FIG. **6** shows waveforms for an example in which step S**1** is performed by switching inverter **3** of FIG. **3**C at a single switching frequency and supply voltage VDC, with no wireless power receiver **11** present. In this example, VDC is 8V, which causes inverter **3** to produce a square wave of 8 Vpp, as shown by waveform **61**. In this example, the switching frequency of the inverter **3** is 175 kHz. The switching of inverter **3** in step S**1** is performed for 206 microseconds. Then, S**1** ends by stopping the switching of inverter **3**, and the resonance is allowed to freely decay in step S**2**. The current through inductor L_{RES} is shown as waveform **62**. The voltage of node Vres**1** is shown as waveform **63**. As can be seen from waveforms **62** and **63**, the resonance decays freely in step S**2** once the stimulus in step S**1** is stopped.

[0047] FIG. **7** shows waveforms for an example similar to FIG. **6** in which a wireless power receiver **11** is present in the field produced by the wireless power transmitter **1**. The present inventors have recognized and appreciated that when a wireless power receiver **11** is present the decay of the resonance can vary depending on the state of charge of the filter capacitor of the rectifier filter capacitor Crec (FIG. **5**). If Crec is not charged to a point where the diodes of the rectifier **14** are reverse-biased, the resonance at the wireless power transmitter **1** may be loaded by the wireless power receiver to charge Crec. This can affect the rate at which the resonance of the transmitter decays, which may affect the measurement of the decay, and thus impact the accuracy of foreign object detection.

[0048] FIG. **7** illustrates this problem. FIG. **7** shows the stimulus waveform **71** produced by inverter **3**, waveform **72** showing the current through inductor L_{RES}, waveform **73** showing the voltage of node Vres**1**, waveform **74** showing the current through rectifier filter capacitor Crec, waveform **75** showing the voltage at the input of the rectifier **14**, and waveform **76** showing the voltage across the rectifier filter capacitor Crec. In this example, the rectifier filter capacitor Crec has a capacitor of 40 μF, by way of illustration. The stimulus waveform **71** frequency, voltage and duration are the same as that discussed above with respect to FIG. **6**. In the example of FIG. **7**, since the wireless power receiver is present the rectifier filter capacitor Crec charges up during the period in which the stimulus waveform **71** is applied in step S**1**. The inventors have recognized and appreciated that if capacitor Crec is not fully charged by the end of step S**1** it may continue to charge during step S**2**, which may load the decaying resonance at the transmitter and skewing the measurement of the resonance decay. FIG. **7** illustrates in waveforms **76** and **74** that the rectifier filter capacitor Crec is not fully charged by the end of step S**1**, such that current continues to flow into the rectifier filter capacitor Crec during S**2**, which may adversely affect the measurement of the resonance decay.

[0049] FIG. **8** shows an example of a stimulus that can fully charge the rectifier filter capacitor Crec prior to step S**2**. In this example, VDC is 8V, the switching frequency of the inverter **3** is 200 kHz, and step S**1** lasts 600 microseconds. FIG. **8** shows the stimulus waveform **81** produced by inverter **3**, waveform **82** showing the current through inductor L_{RES}, waveform **83** showing the voltage of node Vres**1**, waveform **84** showing the current through rectifier filter capacitor Crec, waveform **85** showing the voltage at the input of the rectifier **14**, and waveform **86** showing the voltage across the rectifier filter capacitor Crec. As shown, the rectifier filter capacitor Crec can be fully charged before the start of step S**2** by applying the stimulus for a sufficient duration. However, one disadvantage of this approach is that it involves increasing the length of step S**1**, which may be inefficient, as power may be dissipated during step S**1**.

[0050] In some embodiments, the duration of step S**1** can be reduced by applying a sequence of inverter stimulus waveforms at different energy levels. The inverter stimulus waveform may have a period of time in which relatively high energy level is applied, followed by a period of time with a lower energy level applied. Using a relatively high energy level initially allows charging the rectifier filter capacitor Crec quickly. Then, the energy level can be reduced to allow improved efficiency.

[0051] Applying a sequence of inverter stimulus waveforms can include applying a "double stimulus" in which a first stimulus is applied in step S**1***a* and a second stimulus is applied in step S**1***b*, which may be at a lower power level than in step S**1***a*. However, the techniques described herein